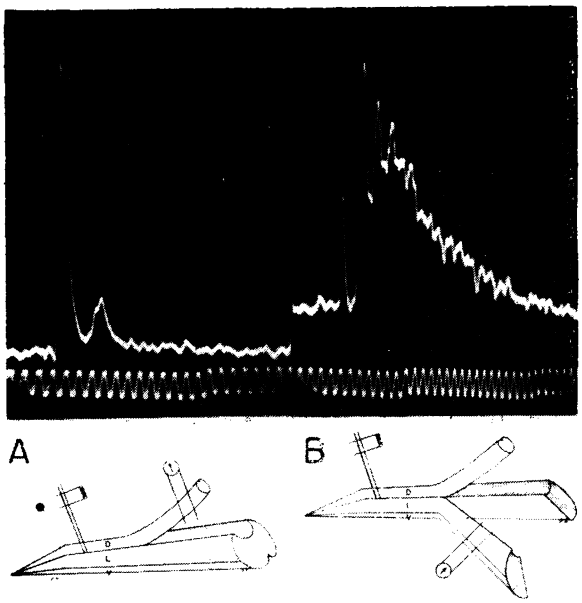

FIG. 3. *A*, dorsal column response to L_6 dorsal root stimulus. *B*, response of ventrolateral column to homolateral L_6 dorsal root stimulus. Stimulus pulse, first negative potential on left. Same preparation and conduction distance as *A*. Cord was split down the midline after the dorsal column had been freed. Time signal, 1,000 cps. Note the absence of triphasicity.

generated by the volley of nerve impulses traveling rostrally in the dorsal columns (dissected down to L_4) can be seen in Fig. 3A. The first spike is analagous to the directly conducted spike of the complex dorsal cord potential described by Gasser and Graham (*7*). The second component disappears more readily on tetanization and lags behind the spike by an amount (2.7 msecs) equal to that of the dorsal column relay potential described by Hursh (*8*). In the undissected cord this potential would be obscured at this level by other potentials arising concurrently in grey matter. Traveling out into the homolateral ventrolateral columns simultaneously with the dorsal column potential is a potential of different character (Fig. 3B). Its spike is delayed by a time interval corresponding to one synaptic delay behind that of the dorsal column spike, as would be expected on the basis of neuroanatomy and as already shown for the intact cord (*9, 10*). The slow negative potential following the spike is a consequence of synaptic activity and has been discussed extensively in the neurophysiological literature. All recordings were taken from stripped tissue with the proximal recording electrode 1.5 cm away from intact cord in order to avoid electrotonic derivatives of its activity. The recording leads have been carried to an RC-coupled preamplifier in such a manner that an upward deflection on the cathode-ray oscilloscope was produced when the electrode nearer intact cord was negative to the distal one.

The details of dissection have been worked out in 40 cats over the past year. The sample records presented here are intended mainly to demonstrate the nature of a method that promises to aid analysis of central nervous system mechanisms by disengaging them along functional and anatomical lines.

References

1. FENN, W. O. *J. Gen. Physiol.*, **10**, 767 (1927).
2. GERARD, R. W. *Am. J. Physiol.*, **82**, 381 (1927).
3. GASSER, H. S. *Ohio J. Sci.*, **41**, 145 (1941).
4. LLOYD, D. P. C. *J. Neurophysiol.*, **4**, 115 (1941).
5. SHERRINGTON, C. S. *Proc. Roy. Soc.* (*London*), **61**, 243 (1897).
6. LORENTE DE NO, R. *Studies from the Rockefeller Institute*, **131**, **132** (1947).
7. GASSER, H. S., and GRAHAM, H. T. *Am. J. Physiol.*, **103**, 303 (1933).
8. HURSH, J. B. *J. Neurophysiol.*, **3**, 166 (1940).
9. GRUNDFEST, H., and CAMPBELL, B. *Ibid.*, **5**, 275 (1942).
10. LLOYD, D. P. C., and MCINTYRE, A. K. *Ibid.*, **13**, 39 (1950).

Lewis Evans' Early American Notice of Isostacy

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The term "isostacy" was first proposed by Dutton in 1889 (*1, 2*). As early as about 1500 Leonardo da Vinci (*3, 4*) recognized that change of load causes movement of the earth's crust. The earliest recognition in America of what we now call isostatic adjustment appears to have been in 1743 by Lewis Evans, colonial surveyor, cartographer, and geological observer.

Evans was born in Wales about 1700 and died in New York in 1756 (*5*). He is best known for his *Map of the Middle British Colonies* (*6*). He was a keen observer of geologic phenomena and topography and inserted geologic notes on his earlier maps (*7*) and included much more extended geologic notes in *An Analysis of a General Map . . .*, a booklet of 36 pages which accompanied his 1755 map (*8*). Evans' surprisingly modern geological observations, almost completely unnoticed by historians of geology, are now the subject of study, which will be reported more extensively elsewhere.

Evans' remarks on isostacy were recorded in a journal he kept while on an expedition in 1743 from Philadelphia to Onondago and Lake Ontario with John Bartram (*9*), the pioneer botanist, and Conrad Weiser, interpreter and "ambassador" to the Indian tribes. The journal was not published by Evans and is now lost, but a copy was in possession of Thomas Pownall, colonial administrator and patron of Evans, who published parts of it. In 1776 Pownall brought out a revised edition of Evans' 1755 map and *Analysis* (*10*), which he supplemented with his own observations, especially of New England, a territory not well known to Evans. Pownall is careful to indicate exactly the material copied from Evans' *Analysis* and from Evans' 1743 journal. Pownall's original publication is now rare, but a new edition based on Pownall's notes for a revised edition was published in 1949 (*11*).

Pownall, after a discussion of the Appalachian ridges and valleys, in which he mainly quotes Evans' *Analysis*, introduces Evans' unpublished journal observation of 1743 on fossils, the drainage of once

much more extensive Great Lakes, and the consequent effect on crustal elevation and concomitant eustatic movement of sea level. The material on isostacy from Evans' journal is on pages 29 and 30 of the 1776 edition (*10*) and on pages 112–116 of that of 1949 (*11*):

Amidst the Detail of these dry Descriptions, it may perhaps relieve and amuse the Reader to insert some Observations and Opinions which I found in and extracted from Mr. Evans' Journal.

"The Stones in all Parts of these Mountains are full of Sea Shells: . . .

"Various Systems and Theories of the present Earth have been devised in order to account for this Phaenominon. One System supposes that the Whole of this Continent, the highest Mountains themselves, as they now appear, were formerly but one large Plain, inclining with a considerable Slant towards the Sea; that this has been worn into its present Appearance of Ridges, with Vales between them, by the Rains of the Heavens and Waters of the Earth washing away the Soil from the upper Parts, and carrying it down to Seawards. That the Soil thus carried down and lodged in various Places hath in a Series of Ages formed the lower Plains of the Jerseys, Pennsylvania, Maryland, Virginia, and the Carolinas. . . .

"But we must have recourse to some other Explanation in order to account for the Situation of the Shells on the Tops of the Mountains.

"It is easy to shew the Earth and Sea may assume one another's Places, but positively to assert how that hath actually happened in Times past, is hazardous; we know what an immease Body of Water is contained in the great Lakes at the Top of the Country, and this is a damm'd and held up by Ridges of Rocks: Let us suppose these Ridges broken down by any natural Accident, or that in a long Course of Ages a Passage may be worn through them, the Space occupied by the Water would be drained: This part of America, disburthened of such a Load of Waters, would of course rise, as the immediate Effect of the shifting of the Center of Gravity in the Globe at once or by Degrees, much or little, accordingly as the Operation of such Event had Effect on that Center. . . .

". . . Some such Changes may have come gradually and advanced by such slow Degrees, as that in a Period of a few Ages would not be perceptible; History therefore could take no Notice of them."

Evans recognized the late Pleistocene beach ridges near Lake Ontario as former shore lines of a once more extensive lake, but he assumed also that the fossils in the Paleozoic rocks of the northern Appalachian mountains and Allegheny plateau were remains of forms which once lived in the very much larger body of water which spread to the eastern margin of the mountains. There is some evidence that Evans realized the consolidated Paleozoic rocks were much older that the lacustrine Pleistocene deposits near Lake Ontario. The belief in a great water body extending to the eastern margin of the mountains was held at least until 1818, when Mitchill set forth the idea in great detail (*12*). A few years earlier Volney (*13*) had proposed the same theory. Their source was Evans, but neither followed him in ascribing land uplift to reduction in crustal load.

References

1. DUTTON, C. E. *Phil. Soc. Washington,* **11**, 51 (1889).
2. BOWIE, W. *Isostacy.* New York: Dutton (1927).
3. DELANEY, J. P. *Science,* **91**, 546 (1940).
4. MACCURDY, E. *The Notebooks of Leonardo da Vinci,* 2 vol., New York: Reynal & Hitchcock (1938).
5. GIPSON, L. H. *Lewis Evans.* Philadelphia: Historical Society of Pennsylvania (1939).
6. EVANS, L. *A General Map of the Middle British Colonies . . .* Philadelphia: (1755).
7. ———. *A Map of Pennsylvania, New Jersey, New York . . .* Philadelphia: (1749, 1752).
8. ———. *An Analysis of a General Map of the Middle British Colonies . . .* Philadelphia: B. Franklin and D. Hall (1755).
9. BARTRAM, J. *Observations on the Inhabitants, Climate, Soil Rivers . . .* London: J. Whiston and B. White (1751).
10. POWNALL, T. *A Topographical Description of such Parts of North America as are Contained in the (annexed) Map of the Middle British Colonies in North America.* London: 1776).
11. ———. In Mulkearn, L. (Ed.), *A Topographical Description of the United States of America (being a revised and enlarged edition).* Pittsburgh: University of Pittsburgh Press (1949).
12. MITCHILL, S. L. *Observation on the Geology of North America . . .* pp. 319–431 of Jameson's translation of Cuvier, *Essay on the Theory of the Earth.* New York: Kirk & Mercein (1818).
13. VOLNEY, C. F. *View of the Climate and Soil of the United States of America . . .* London: (1804).

Liver Cirrhosis with Ascites, Induced in Dogs by Chronic Massive Hepatic Irradiation with Radioactive Colloidal Gold[1]

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In a comprehensive review of the effects of radiation on normal tissue Shields Warren (*1*) has stated that "without much conclusive evidence, it has been assumed that the liver as an organ is relatively resistant to radiation injury." Chronic damage was induced in the liver of the dog by Bolliger and Inglis (*2*) using repeated very high doses (1,800–5,250 r) of unfiltered radiation, fibrosis being noted in some dogs as early as 6 weeks after exposure. In one dog a dense portal fibrosis was observed after 6 months. To the best of our knowledge no instance of extensive cirrhosis associated with ascites has been reported.

Fouts (*3*), as well as McKibbin, Thayer, and Stare (*4*), have shown that it is possible to induce cirrhosis in dogs by prolonged dietary restrictions. McKee and associates (*5*) have briefly summarized the experimental approach to the production of ascites by means of mechanical constriction of the hepatic blood vessels.

We wish to describe briefly a means of producing highly interesting lesions in the dog liver made possible by the relatively high degree of selective uptake by that organ of radioactive colloids of gold which, following intravenous administration, undergo rapid phagocytosis.

[1] This work was carried out under Contract At-(40-1)-269 with the Division of Biology and Medicine, Atomic Energy Commission.